REMARKS

This amendment responds to the Office Action dated February 12, 2003 in which the Examiner objected to the drawings, rejected claims 1-3, 6-7, 9-12 and 14-15 under 35 U.S.C. §103, objected to claims 8 and 16 as being dependent upon a rejected base claim but would be allowable if rewritten in independent form and stated that claims 4-5 and 13 are allowed.

Concurrently filed with this amendment is a Request for Approval of Drawing Changes in order to label Figures 11 and 12 prior art and in order to correct misspellings in Figure 7. Furthermore, as indicated above, the specification has been amended in order to refer to the reference signs identified by the Examiner which was not originally described in the specification but shown in the drawings. It is respectfully requested that the Examiner approves the corrections and withdraws the objection to the drawings.

Claims 1 and 10 claim a digital camera that records a captured image as digital data. The digital camera comprises an image pickup device, an A/D converter, a recording device, a data processor and a display device. The data processor performs color separation of the digital image data into pixel data of different colors or components based upon recorded filter alignment or pixel arrangement data and interpolates for missing pixels for each color or component.

Through the structure of the claimed invention having a data processor which interpolates for missing pixels provided within the digital camera itself, as claimed in claims 1 and 10, the claimed invention provides a digital camera in which the image can be

immediately displayed on a display unit so that the user can preview the image. The prior art does not show, teach or suggest the invention as claimed in claims 1 and 10.

Claims 6 and 14 claim a method for recording and displaying an image comprising the steps of; the first, sensing an image with an image sensor having an array of pixels. Each pixel generates data relating to one of a plurality of colors or components. Next, both data generated by the individual pixels of the image sensor and information which describes the colors or components that are associated with the individual pixels are simultaneously stored at a first site. The stored data and stored information from the first site are then transmitted to a second site. The data at the second site is interpolated in accordance with the stored information to generate complete color or image data for the individual pixels. Finally, the image is reproduced in accordance with the complete color or image data.

Through the method of the claimed invention simultaneously storing data which is generated by the individual pixels and information which describes the arrangement of the individual pixels relative to different components or colors as claimed in claims 6 and 14, the claimed invention provides a method for recording and displaying an image which reduces the load on the recording medium data storage capacity. The prior art does not show, teach or suggest the method as claimed in claims 6 and 14.

Claims 1-3, 6-7, 9-12 and 14-15 were rejected under 35 U.S.C. §103 as being unpatentable over *Rashkovskiy et al.* (U.S. Patent No. 6,181,376) in view of *Konishi* (U.S. Patent No. 4,574,319).

Applicant respectfully traverses the Examiner's rejection of the claims under 35 U.S.C. §103. The claims have been reviewed in light of the Office Action, and for reasons which will be set forth below, it is respectfully requested that the Examiner withdraws the rejection to claims and allows the claims to issue.

Rashkovskiy et al. appears to disclose in FIG. 2 a block diagram of a digital camera having a color filter image stored in a memory. Digital Camera 10 uses Lens 12 to accept light from the environment around the camera. The light passes through and is filtered by Color Filter Array 13 and is sensed by electronics Sensors 14. The resulting Color Filter Image 16 is stored in Memory 18. The Sensors may be CCDs, CMOS arrays, or other light sensing devices. The Color Filter Image is a representation of the image sensed by the camera. Memory 18 is coupled to Interfaces (I/F) 20, 22 to connect Digital Camera 10 to a Computer System 24 for displaying the captured images. Computer System 24 is a general purpose computer such as a personal computer (PC) or workstation having a Processor 26, Memory 28, and a Display 30. The Color Filter Image 16 generated by Digital Camera 10 is stored as Color Filter Image 16' in Memory 28 in Computer System 24 and manipulated as a result of instructions being executed by Processor 26. (Col. 3, line 61 through col. 4, line 11)

Thus, *Rashkovskiy et al.* merely discloses a digital camera 10 connected to a computer system 24 having a processor 26. Nothing in Rashkovskiy et al. shows, teaches or suggests that the digital camera itself contains a data processor which interpolates for missing pixels as claimed in claims 1 and 10. Rather, *Rashkovskiy et al.* teaches away

from the claimed invention since the processor 26 in *Rashkovskiy et al.* is only formed within the separate computer system 24 which is external to the digital camera 10.

Additionally, *Rashkovskiy et al.* merely discloses storing a color filter image 16 in a memory 18 which is a representation of the image sensed by the camera. Nothing in *Rashkovskiy et al.* shows, teaches or suggests simultaneously storing the data which is generated by the individual pixels and information which describes colors or different components as claimed in claims 6 and 14. Rather, *Rashkovskiy et al.* merely discloses that light having passed through and filtered by a color filter array 13 is sensed by sensors 14 and the resulting color filter image 16 is stored in memory 18.

Konishi appears to disclose when the image is formed on the image pickup device 5, each photoelectric conversion picture element constituting the image pickup device 5 generates an electric signal according to the light intensity received thereat, and temporarily stores the electric signal. The electric signal stored in the photoelectric conversion cells is then sequentially output from a scanner 6 to a signal processor 7. The signal processor 7 has an amplifier, a quantizer or the like, and performs processing operations such as amplification, encoding or the like of the electric signal fed from the scanner 6. The electric signal thus processed is then recorded on a recording medium 10, which is releasably fitted on a recorder 9, as the image data is recorded by the recorder 9 according to a synchronizing signal generated by a synchronizing signal generator 8. (Col. 3, lines 50-65) The addresses of defective picture elements of the image pickup device 5, information on the arrangement of the color filter array provided on the surface of the image pickup device 5, or the like, are already fixed when the image pickup device 5 is manufactured. Data of this type may for

example be output as the data for compensation in image reproduction when the data is recorded on the recording medium by use of a ROM (read only memory) for encoding and storing these data in the data memory 13. The above-mentioned code for discriminating between continuous shooting and single frame shooting modes of the photographed image may be recorded by using the members for indicating these modes in the camera body, or may be automatically recorded by detecting the shutter operation. The camera body 2 is also provided with a shutter button 16, view finder 17 or the like as in the case of a conventional camera. The above-described various data to be recorded together with the image data are input to the recording medium as described below. For example, information on defective addresses for indicating the positions of defective picture elements of the image pickup device 5, information on the arrangement of the color filter array provided on the surface of the image pickup device 5, information which is already fixed when the image pickup device 5 is manufactured and which effects all image information recorded, the code for keeping the whole record secret, or the like, are automatically recorded by the ROM for encoding and storing these types of information in the data memory 13 when the loading of the recording medium 10 into the camera body 2 is detected. Or, such information is manually input to the recording medium 10 by use of the manual data input unit 14 after recording medium 10 loaded into the camera body 2. (Col. 4, line 56 through Col. 5, line 23)

Thus, *Konishi* merely discloses a camera including a signal processor which performs processing operations such as amplification, and coding or the like on the electrical signal fed from a scanner 6. Nothing in *Konishi* shows, teaches or suggests a data processor which interpolates for missing pixels as claimed in claims 1 and 10. Rather,

Konishi merely discloses a signal processor which performs processing operations such as amplification and encoding.

Additionally, *Konishi* merely discloses storing information on the arrangement of the color filter array when the loading medium 10 is loaded into the camera body 2 (column 5, lines 17-20). Nothing in *Konishi* shows, teaches or suggests simultaneously storing the data which is generated by individual pixels and information which describes the colors or components as claimed in claims 6 and 14. Rather, *Konishi* teaches away from the claimed invention and merely discloses that the arrangement of the color filter array information is stored when the loading of the recording medium into the camera body is detected.

Since nothing in *Rashkovskiy et al.* or *Konishi* show, teach or suggest a) a digital camera including a data processor that interpolates for missing pixels as claimed in claims 1 and 10 or b) simultaneously storing data which is generated by individual pixels and information which describes the colors or components as claimed in claims 6 and 14, it is respectfully requested that the Examiner withdraws the rejection to claims 1, 6, 10 and 14 under 35 U.S.C. §103.

Claims 2-3, 7, 9, 11-12 and 15 depend from claims 1, 6, 10 and 14 and recite additional features. It is respectfully submitted that claims 2-3, 7, 9, 11-12 and 15 would not have been obvious within the meaning of 35 U.S.C. §103 over *Rashkovskiy et al.* and *Konishi* at least for the reasons as set forth above. Therefore, it is respectfully requested that the Examiner withdraws the rejection to claims 2-3, 7, 9, 11-12 and 15 under 35 U.S.C. §103.

Since objected to claims 8 and 16 depend from allowable claims, it is respectfully requested that the Examiner withdraws the objection thereto.

New claims 17-20 have been added and recite additional features. It is respectfully submitted that these claims are also in condition for allowance.

The prior art of record, which is not relied upon, is acknowledge. The references taken singularly or in combination do not anticipate or make obvious the claimed invention.

Thus it now appears that the application is in condition for reconsideration and allowance. Reconsideration and allowance at an early date are respectfully requested.

If for any reason Examiner feels that the application is not now in condition for allowance, it is respectfully requested that the Examiner contact, by telephone, the applicant's undersigned attorney at the indicated telephone number to arrange for an interview to expedite the disposition of this case.

In the event that this paper is not timely filed within the currently set shortened statutory period, applicant respectfully petitions for an appropriate extension of time. The fees for such extension of time may be charged to our Deposit Account No. 02-4800.

In the event that any additional fees are due with this paper, please charge our Deposit Account No. 02-4800.

Respectfully submitted,

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Mark-up of Specification

Paragraph bridging pages 1 and 2

The signal processing sequence in a conventional digital camera, of the type described above, will be explained with reference to Fig. 11. In a digital camera 61, where an image is formed on the CCD, an R, G or B pixel signal is obtained for each pixel by means of the R, G and B filters which are located in one-to-one relationship with individual pixels (S61). In step S62, these pixel signals are converted through A/D conversion, and digital image data is created (S63). In order to create a color image, single digital image data comprising composite R, G and B pixel data is separated into individual sets of R, G and B pixel data, including missing pixels. In step S64, the missing pixels in the pixel data of each color are interpolated by means of a method incorporated in the camera, using the data from the surrounding pixels to create R, G and B complete pixel data. After that, the R, G and B complete pixel data is recorded (S66) on a recording medium, after being compressed if necessary [(S66)] (S65). A single color image is obtained by overlapping the complete pixel data. When this image data is input to a personal computer ('PC') 70, the personal computer 70 expands it (S67), whereupon the image data (S68) created by the digital camera 61 is obtained.

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Paragraph beginning at Page 7, line 9

The situation in which the image is output to a display connected to the personal computer 20 will first be explained. In this embodiment, the second memory 10 comprises an IC card, and consequently, the image data and filter alignment data recorded in the second memory 10 are input to the personal computer 20 by inserting this IC card into the data input unit 21 of the personal computer 20. This personal computer 20 has a dedicated reproduction software program that enables it to (1) read the input filter alignment data as well as the image data, (2) separate the image data into data of three different colors based on this filter alignment data, and (3) perform interpolation for missing pixels. Using this program, the personal computer 20 can expand the input image data if necessary (S10 in Fig. 3) and separates the pixel data into R, G and B groups. It then can perform missing pixel interpolation in S11. In this case, the user may select a desired interpolation method from among different interpolation methods incorporated as programs in the computer (the averaging method or the median method, for example). The R, G and B complete pixel data (S12) created through the processing described above is overlaid on itself and output on the display as a single color image.

Paragraph bridging pages 7 and 8

A case in which the image is output to the built-in LCD display unit 12 of the camera 1 will now be explained. Here, the image data and filter alignment data recorded in the second memory 10 are read, with the IC card comprising the second memory 10

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connected to the camera 1. The CPU 8 that controls the camera (see Fig. 1) expands the image data if necessary (S5 in Fig. 3) and separates the pixel data into R, G and B groups. It then performs interpolation for the missing pixels for each color in S6 using an interpolation method incorporated in the camera. The R, G and B complete pixel data (S7) created through this processing is overlaid on itself and output to the LCD display unit 12 (S8) as a single color image.

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Mark-up of Claims 6 and 14

6. (Amended) A method for recording and displaying an image, comprising the steps of:

sensing an image with an image sensor having an array of pixels, where each pixel generates data relating to one of a plurality of colors;

simultaneously storing the data generated by the individual pixels of the image sensor [at a first site; storing] and information which describes the colors that are respectively associated with the individual pixels in said array at [said] a first site;

transmitting the stored data and the stored information from said first site to a second site;

interpolating said data at said second site in accordance with said stored information to generate complete color data for the individual pixels; and

reproducing the image in accordance with the complete color data.

14. (Amended) A method for recording and displaying an image, comprising the steps of:

sensing an image with an image sensor having an array of pixels, where each pixel generates data relating to one of a plurality of different components of an image;

simultaneously storing the data generated by the individual pixels of the image sensor [at a first site; storing] and information which describes the arrangement of the individual pixels in said array, relative to said different components, at [said] a first site;

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transmitting the stored data and the stored information from said first site to a second site;

interpolating said data at said second site in accordance with said stored information to generate complete image data for each of the individual pixels; and

reproducing the image in accordance with the complete image data.